EFFECTIVENESS OF CONSTRAINT INDUCED MOVEMENT THERAPY VERSUS BI-MANUAL TRAINING IN IMPROVING THE HAND FUNCTION (UPPER LIMB MOTOR FUNCTION) IN CHILDREN WITH HEMIPLEGIC CEREBRAL PALSY – A COMPARATIVE STUDY

DISSERTATION

Submitted for the partial fulfilment of the requirement for the degree of

MASTER OF PHYSIOTHERAPY (MPT)

ELECTIVE: ADVANCED PHYSIOTHERAPY IN NEUROLOGY

Done by

SHAMEELA.K

Bearing Regn. No:271620265

Submitted to:

THE TAMILNADU DR.M.G.R MEDICAL UNIVERSITY

CHENNAI – 600032.

APRIL – 2018

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Seal & Signature of Principal

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PROF. R. RADHAKRISHNAN,MPT.,PGDHM.,

Mohamed Sathak A .J College of Physiotherapy

Date:

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CERTIFICATE

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…… ……..…….

Internal Examiner External Examiner

Place:

Date:

DECLARATION BY THE CANDIDATE

I hereby declare that the Dissertation entitled "**EFFECTIVENESS OF CONSTRAINT INDUCED MOVEMENT THERAPY VERSUS BIMANUAL TRAINING IN IMPROVING THE HAND FUNCTION (UPPER LIMB MOTOR FUNCTION) IN CHILDREN WITH HEMIPLEGIC CEREBRAL PALSY – A COMPARATIVE STUDY**" was done by me for the partial fulfillment of therequirement of Master of Physiotherapy degree. The dissertation had been done under the direct supervision and guidance of my Guide PROF.K.PREMANAND, MPT at **Mohamed Sathak A.Jcollege of Physiotherapy**, Chennai, and submitted the same during the year April 2018 to **The TamilnaduDr. M.G.R Medical University**.

…..……

Signature of the Candidate

Date :

Place : Chennai

ACKNOWLEDGEMENT

I thank the **ALMIGHTY**for blessing me in all aspects to complete the dissertation successfully.

I thank our **Management** for providing sufficient books, good faculties and facilitating us to explore and gain a wide knowledge.

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I wish to express my sincere and heartfelt thanks to my guide Prof.K.Premanand, MPT for continual support, profound interest and timely and valuable suggestion throughout the period of the study.

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I extended my thanks to all who motivated and helped me in all aspects to complete the study.

INDEX

ABSTRACT

TITLE:

Effectiveness of constraint induced movement therapy versus bi – manual training in improving the hand function(upper limb motor function) in children with hemiplegic cerebral palsy – A comparative study.

OBJECTIVE:

This study aims at determining the effectiveness of constraint induced movement therapy as compared to bimanual therapy for improving functional status in children with hemiplegic cerebral palsy.

METHODOLOGY:

This study was a randomized control trial, children (n = 15) with spastic hemiplegic cerebral palsy was randomly allocated to CIMT (constraint induced movement therapy) and BMT (bimanual therapy) group. The children with spastic hemiplegia, age between 5 to14 year and having 10 degrees of wrist extension and 10 degrees of finger extension were included in study. Treatment regime was two hours of daily training six days a week for 8 weeks.

RESULT:

When comparing the values between the group A who received CIMT and group B who receives bimanual therapy, group A shows more significant improvement in response to intervention. Thus, constraint induced movement therapy shows more effective in improving upper limb function in hemiplegic cerebral palsy.

CONCLUSION:

It is shown from this study that constraint induced movement therapy(CIMT) is more effective than bimanual therapy in hemiplegic cerebral palsy. Since CIMT is a simple, reliable, safe and effective technique. It can be recommended as a method to be followed in hemiplegic cerebral palsy rather than traditional methods like passive movements. However, as this study done in a smaller sample size, future studies have to be done in larger sample size to validate this result.

KEYWORDS:

Constraint induced movement therapy, Bimanual therapy, Hemiplegic Cerebral Palsy.

INTRODUCTION

Cerebral palsy is defined as "a group of permanent disorders of the development of movement and posture, causing activity limitation, that are attributed to non-progressive disturbances that occurred in the developing fetal or infant brain"[1].

Disabled children are of great concern to a family as well as to the society. When disability is discussed, particularly in children, about a quarter of chronic childhood problems are neurological in origin. Cerebral palsy (CP) is the leading cause of chronic disability in children[2] ,making them physically and mentally handicapped and socially aloof. The worldwide incidence of CP is approximately 2 to 2.5 cases per 1000 live births.[3] In India, it is estimated at around 3 cases per 1000 live births; however, being a developing country the actual figure may be much higher than probable figures. There are about 25 lakh CP children in India as per the last statistical information.

Cerebral Palsy has to be viewed in terms of its incidence, etiology,
Clinical definition, diagnosis, therapeutic and associated interventions. Long term care programmes for mainstreaming with vocational and educational inputs, and well researched and meaningful approaches to prevention also become relevant.

Clearly, there is on going need to target rehabilitation intervention in reducing motor impairment, in recent times many treatment techniques have been developed to improve upper limb functions in child with hemiplegic CP. One of the treatment strategies is constraint induced movement therapy intended to promote upper limb functional status. Bimanual training is also one of the treatment strategies to improve upper limb functional level.

For children with unilateral CP, the effect on upper limb (UL) function is often more pronounced than that on lower limb function with resultant limitations in daily independence, participation, and quality of life. Rehabilitation addressing UL dysfunction is paramount to promote better use of the impaired arm and hand in day-to-day bimanual activities and to achieve functional independence in home, school, and community endeavours[4]. Hand-Arm Bimanual Intensive Therapy (BIT) is an advanced technique to improve the use and coordination of both arms in daily function in hemiplegic cerebral palsy children. Bimanual training is performed in group settings with an emphasis of having fun.

A child with hemiparesis or hemiplegia may experience excessive muscle tone in his hand, arm and shoulder, making it difficult for him to use his hand in daily living

activities. She may have problems moving her fingers independently, turning her hand over (palm up), holding her wrist at a proper angle, and grasping and releasing objects. You may be able to help your child gain more functional use of his hand by working (playing) with him on hand movements.

Constraint-induced movement therapy (CIMT), was developed by **Taub et al.,** this technique involves 3 key principles: (1) the forced use of the affected hand by restraining the intact arm, (2) training by shaping movements with the affected hand and (3) massing the practice of both elements. It emphasizes massed practice with the more affected arm for 6 hours each day. CIMT achieves long term improvements of the amount of use and the quality of movement of the affected limb. However, many patientseasily grew tired of wearing the mitt for long time and feel difficulty in with adherence of 6hrs of therapy time. To overcome this facility, **Annette sterr et al.,** introduced CIMT with a modified version in which the daily training schedule has been reduced by 50% to 3 hours a day which is considered as modified constraint-induced movement therapy with similar effects as CIMT.

However, one of the issues of CIMT and modified constraint-induced movement therapy allows compensatory strategy of the same limb to happen whileperforming upper limb activities. Compensatory trunk recruitment may enable an individual to accomplish a goal, but it may be associated with pain or long term functional limitation. Compensatory strategies can sometimes be a hindrance to performing functional activities.

Mindy et al., demonstrated that with the trunk fixed to back of a chair, a small sample CP individuals demonstrated greater voluntary shoulder flexion and elbow extension when reaching to a target within the workspace when compared with reaching with an unfixed trunk. Trunk resistant therapy blocks undesirable movements and facilities normal patterns and there by improve shoulder-elbow-co-ordination pattern and less anterior displacement.

In this study, there will be a comparative study between the effects of CIMT and bimanual training in promoting functional level of upper limb in children with stroke.

AIM

- To find the effectiveness of constraint induced movement therapy versus bi-manual training in improving the hand function (upper limb motor function) on children with hemiplegic cerebral palsy...

OBJECTIVES

- To improve the upper limb function in hemiplegic cerebral palsy.
- To improve the hand function.
- To improve the upper limb motor function.
- To determine the effectiveness of constraint induced movement therapy versus bi-manual training in improving the hand function (upper limb motor function) on children with hemiplegic cerebral palsy...

NEED FOR THE STUDY

- Cerebral palsy is one of the most common neurologic disorders approximately 3 cases per 1000 person. Cerebral palsy patients having a major problem of functional impairments.
- Upper limb function is one of the criteria to define functional independency. So, the functional level of individual with hemiplegic CP has to be improved by improving upper limb motor function.
- There are very few studies, which explored the combined effects of constraint induced movement therapy and bi-manual training in improving function level in hemiplegic CP. In this study, will determine the comparison between the effectiveness of constraint induced movement therapy and bi-manual training in improving the hand function (upper limb motor function) on children with hemiplegic cerebral palsy.

HYPOTHESIS

Null hypothesis:

There will be no significant differences betweenthe effectiveness of constraint induced movement therapy and bi-manual training in improving the hand function (upper limb motor function) on children with hemiplegic cerebral palsy.

OPERATIONAL DEFINITION

- **Cerebral palsy:**

Cerebral Palsy is a blanket term commonly referred to as “CP” and described by loss or impairment of motor function, Cerebral Palsy is actually caused by brain damage. The brain damage is caused by brain injury or abnormal development of the brain that occurs while a child’s brain is still developing before birth, during birth, or immediately after birth. CP affects body movement, muscle control, muscle coordination, muscle tone, reflex, posture and balance. It can also impact fine motor skills, gross motor skills and oral motor functioning.

(Keneth a stern et al., 2003)

- **Constraint induced movement therapy:**

Constraint-induced movement therapy (CIMT) is a form of rehabilitation therapy that improves upper extremity function in stroke and other central nervous system damage victims by increasing the use of their affected upper limb.

(Stephen j et al., 2007)

- **Bimanual intensive therapy:**

Bimanual upper limb therapy is an intensive intervention for children with hemiplegic cerebral palsy who experience movement difficulties in one hand.

(Cerebral palsy alliance research foundation, April 2016)

REVIEW OF LITERATURE

INCIDENCE AND PREVALENCE:

- **Adour et al.,1990** stated that cerebral palsy with the incidence at about 23 per 100,000 adults per year.

UPPER LIMB FUNCTIONING IN HEMIPLEGIC CP:

- **Devriese 1998** stated the sequelae of upper limb function included difficulty with drinking, eating and speaking, and psychosocial problems.
- **Issam M. Al-Bataineh, MD., 2008** stated the importance of rehabilitation of patients with neurological conditions especially in those with hemiplegic cerebral palsy.

CIMT:

- **Annette sterr et al.,** introduced CIMT with a modified version in which the daily training schedule has been reduced by 50% to 3 hours a day which is considered as modified constraint-induced movement therapy with similar effects as CIMT.

- **Beurskens CH et al., 2006**, in a study of persons with cerebral palsy(n=27) and found that CIMT is effective treatment protocol to improve the people physically and psychosocially.

- **Beurskens CH, Heymans PG., 2006**, came to the conclusion after reviewing the available evidence of CIMT therapy in cerebral palsy is a good treatment choice.

- **Wen 2004** reported from his study that there is significantly less motor synkinesis after undergoing upper limb exercise.

- **Beurskens CHG, Heymans PG 2003** had shown positive effects of CIMT onsequelae of cerebral palsy: stiffness, immobility, social and physical aspects of functional disability.

.

BIMANUAL THERAPY:

- **Shiau j et al., 1995**, did a study on Cerebral palsy patients and showed bimanual therapy has long-term effects.

- **Diels HJ et al.,** proved that bimanual therapy is an effective method of rehabilitating and showed improvement in upper limb movements, in patients with cerebral palsy.

MATERIALS AND METHODOLOGY

METHODOLOGY:

STUDY DESIGN:

Comparative Experimental pre versus posttest design.

SAMPLING METHOD:

Convenient sampling.

STUDY SETTING:

Home based setting (community based rehabilitation)

STUDY SAMPLING:

A total of 30 subjects with hemiplegic cerebral palsy.

Group A- 15 subjects (CIMT group)

Group B- 15subjects (Bimanual intensive therapy group)

STUDY DURATION:

8 weeks

OUTCOME MEASUREMENT:

- Action research arm test (ARAT).
- Fugl-meyer motor assessment scale for upper limb.

INCLUSION CRITERIA:

- Child with hemiplegic cerebral palsy.
- Age between 5 to 14 years
- Both male and female
- Unilateral CP child
- Able to actively extend wrist, at least 10^{o}
- 10^{o} of active extension in at least 2 additional digits.
- Some active abduction of carpel metacarpal joint of the thumb.

EXCLUSION CRITERIA:

- Excessive spasticity, (>3 on modified ashworth spasticity scale)
- Severe co-morbidity
- Severe cognitive/perceptual impairment
- Any other neurological, neuromuscular or orthopedic disease.
- Prior upper limb surgery
- Uncontrollable seizures
- Visual problems
- Botulinum toxin an injection in the upper limb within 6 month prior to study.

MATERIALS:

- Mitt with Velcro straps
- Trunk resistant harness
- Chair with back support
- Table
- Peg board
- Box and block
- Cones
- Cricket ball
- Two different sizes of alloy tubes
- Two glasses, a marble
- Washer and bolt
- Shirt
- Shoes with laces
- Spoon and fork (fork with blunt edges).
- Rice
- Sand
- Washable markers
- Nail painters
- Stickers
- Stamps
- Containers
- Chocolates

- Papers
- Plastic bottles
- Water and coloured water.
- Beads
- Doll
- Clothes
- Towels

PROCEDURE

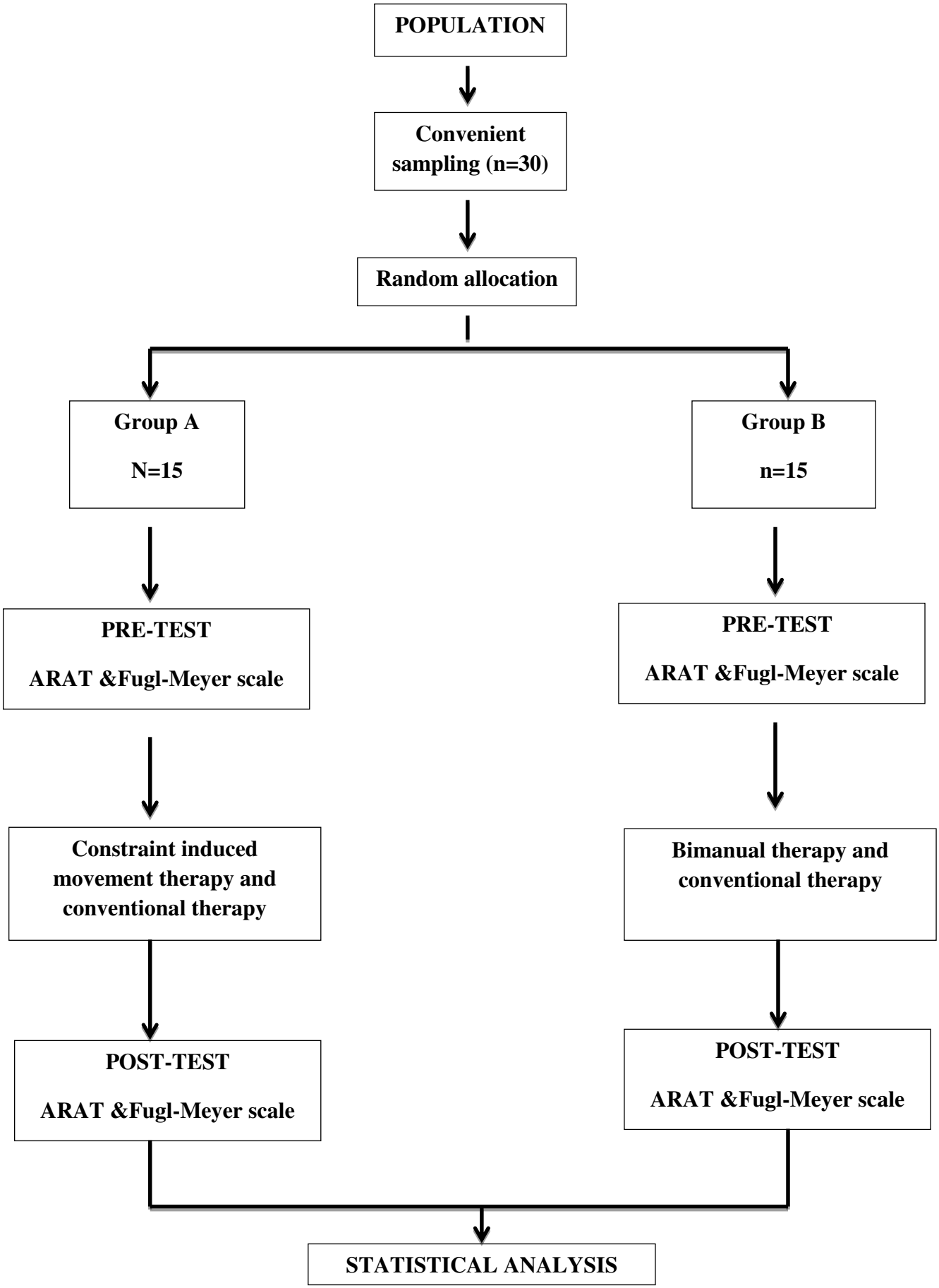
- The patients were selected based on inclusion and exclusion criteria.
- Total number of subjects was 30 and was divided in to group A and group B.
- Group A receives constraint induced movement therapy along with conventional therapy.
- Group B receives bimanual therapy along with conventional therapy.
- The study was done by a research design of pre-test and post-test measurement using Fugl-Meyer assessment of physical performance scale for upper limb and action research arm test.
- After pre-test assessment, the samples of the group A receive conventional therapy for 45 minutes and 30 minutes of constraint-induced movement therapy for 5days /week. Values were recorded in the case sheet.
- After pre-test assessment, the samples of group B receive conventional therapy for 45 minutes and 30 minutes of bimanual therapy for 5days/week. Values were recorded in the case sheet.

PRE TEST ASSESSMENT PROCEDURE

Subjects in both group A and group B were measured using Fugl-Meyer assessment scale and Action Research Arm Test scale to assess the improvement in functional level in upper limb and values were recorded in the case sheet.

The values obtained during assessment in patients would be considered as pre-test values.

Flow chart


POPULATION
Convenient sampling (n=30)
Random allocation
Group A
N=15
Group B
n=15
PRE-TEST
ARAT &Fugl-Meyer scale
PRE-TEST
ARAT &Fugl-Meyer scale
Constraint induced movement therapy and conventional therapy
Bimanual therapy and conventional therapy
POST-TEST
ARAT &Fugl-Meyer scale
POST-TEST
ARAT &Fugl-Meyer scale
STATISTICAL ANALYSIS

INTERVENTION PROCEDURE:

Group A:

After measuring with Fugl-Meyer assessment of physical performance scale and action research arm test scale the subjects in group A underwent treatment with constraint induced movement therapy along with conventional therapy.(Fig 1.1,1.2 and 1.3)

Constraint induced movement therapy:

First component:

- It concentrates on more affected limb use in three functional tasks chosen by patients and therapists (e.g., writing, using a spoon, brushing teeth, combing hair)
- Shaping consists of each of the three chosen tasks being broken down into their smallest subtasks. This is performed by the therapist.
- During the first encounter the patient is in assessment session.
- Specifically, during this 30 minutes therapy session, the patient is assessed on his/her ability to perform each component of each desired task.
  For example: If one of the tasks is reaching for a cup.
- Arm extension, finger extension and release, and elbow flexion as the cup is brought to the mouth would be examples of subtasks comprising the desired outcome.
- The therapist takes note of those components that the patient can and cannot perform.
- During the next sessions, the therapist alternates working with the patient on the deficient motor components of each of the three tasks using shaping techniques.
- As patient become more adept and there are fewer deficient components.
- Two of the tasks can be worked on during a particular session.
- Progressively more difficult tasks, reception and positive reinforcement.
- Therapists also assign homework for each patient.

The second CIMT component consists of:

- Less affected upper limb is restrained.
- Using mitt around the wrist. Every 5days/week for 3 hours.

FIG.1.1 CIMT

FIG.1.2 CIMT

FIG1.3

Conventional therapy:

Active and active assisted movement:

Active and active assisted range of movement for shoulder, elbow, wrist and hand.

Stretching technique:

Stimulation of the muscle elicits reflex contraction of that muscle provided the reflex arc is intact. Sharp but controlled stretching of the affected muscle at the limit of its extended range is followed immediately by the patient's maximum effort to contraction.

Now (stretch)- Pull (let it move):

The muscles stretched in all their components of action and the more accurate the stretch, the greater its effect for producing a contraction.

Strengthening exercise:

The use of resistance to strong groups which normally work with the affected muscle also encourages contraction of that muscle. For e.g. eating pattern involves flexion of the shoulder, elbow, wrist and fingers.

Therefore strong resistance given to the shoulder, wrist and finger flexors will stimulate the flexors of the elbow to contract.

Joint or postural stability developed through the application of isometric exercise. Stability is achieved by activating co-ordination that is the contraction of antagonist muscles that surround proximal joints. Stabilization exercise performed in weight bearing postures in closed kinematics.

Functional re-education:

Fore arm support side lying:

Pressure through the shoulder joint (approximation) stimulates activity in the whole of the shoulder region.

Prone lying with forearm support:

The upper arm must be vertical to ensure balance in the position with minimum effort and the weight should be evenly distributed along the full extent of the forearm and hand. Support being given to both arms stimulates all muscles of the shoulder region to stabilize the position. A rocking movement transferring weight from arm to arm is useful to promote muscular activity.

Group B:

After measuring with Fugl-Meyer assessment of physical performance scale and action research arm test scale the subjects in group B underwent treatment with Bimanual intensive therapy along with conventional therapy.

Bimanual therapy:

Pincer Grasp:

Picking up items between thumb and forefinger

- Picking Gems chocolates out of anbowl.
- Water Bottle Fun. Use clear plastic bottles (labels removed and washed). Have the child use tweezers to place items in the empty bottle. Items can be anything that will tolerate being in water such as plastic flowers, glitter, metal confetti, etc. Next, fill the bottle with plain or coloured water. If you are concerned about the child opening it, you can tape or glue the lid on. This activity engages the hands and is visually appealing.
- Place stickers on the non-affected hand/arm. This way the child has to use the affected hand to remove the sticker. Pre-schoolers love stickers and love to make pictures with them. (A word of caution: to lessen the hold of the sticker, place it on a shirt or other surface to minimize the adhesive before placing it on the child. Some of the adhesives are really strong.)
- Tissue paper scrunching is a really low tech exercise. Have the child crumple up bits of soft paper and then throw them round the room. Then they have to chase them by walking or crawling and pick them up with their toes.

Supination

Rotation of the wrist and forearm so that the palm of the hand is facing upward (toward the ceiling). Pronation means rotating so that palm is facing downward. Children with hemiplegia often have problems with supination of the hand. (Fig 2.1)

- Ring water out of a towel by twisting it
- Turn the pages of a book
- A simple "Slinky" is a great toy to encourage supination
- Build with cones. Build towers or set them up for "bowling", etc. Place or have the child grasp the cone closest to the thumb; the child has to actively supinate at least to neutral to effectively place the cone.
- Scoop up sand, water, or rice and pour into another container. Use a snack activity such as scooping and eating pudding.
- Place stickers, stamps, etc. on the inner arm - turn to look at them.

Sensory:

Sometimes children with hemiplegia have difficulty processing sensory information. Some children may seek more sensory input, while other children may avoid sensory input. This can involve the classic senses of vision, hearing, touch, smell, and taste, as well as the sense of balance and movement and the sense of knowing the position of one's body in space.

- Play in rice, sand, different textures
- The classic containers of rice, beans, sand for weight bearing. Use a small plastic container and bury treasures in it.Weight bear on the affected hand into the container while she searches for treasures or search with the affected hand.
- Paint fingernails wild colours to stimulate interest in her hand.
- Have the child wear colourful hand splints and rings and bracelets.
- Let him paint her arm with washable markers (markers are safe for childrens)

Bilateral Activities:

Children with hemiplegia may not bring hands together in the middle of their body and they may not reach across the body with the affected hands. It's important for development to encourage them to use both hands in play and to reach across the body in both directions. (fig 3.1, fig 3.2, fig 3.3 and fig 3.4)

- Catch large balls with both hands.
- Carry containers of toys and play clean up.
- Open packages of CANDY (very motivating) and baggies of food.
- Play with two handed baby toys –e.g., popping beads
- Dressdolls
- Empty trash cans
- Play with zoom football on a string
- String beads
- Hold paper down with affected hand and draw
- Hold paper with affected hand and cut
- Hold large light weight objects when walking such as a ball
- Push a swing with both hands

FI. 3.1

FIG.3.2

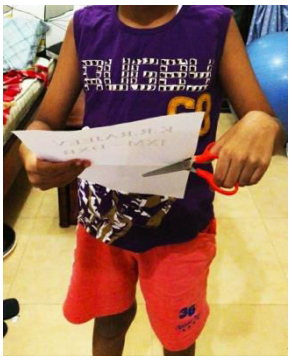


FIG. 3.3

FIG. 3.4

Conventional therapy:

Active and active assisted movement:

Active and active assisted range of movement for shoulder, elbow, wrist and hand.

Stretching technique:

Stimulation of the muscle elicits reflex contraction of that muscle provided the reflex arc is intact. Sharp but controlled stretching of the affected muscle at the limit of its extended range is followed immediately by the patient's maximum effort to contraction.

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Joint or postural stability developed through the application of isometric exercise. Stability is achieved by activating co-ordination that is the contraction of antagonist muscles that surround proximal joints. Stabilization exercise performed in weight bearing postures in closed kinematics.

Functional re-education:

Fore arm support side lying:

Pressure through the shoulder joint (approximation) stimulates activity in the whole of the shoulder region.

Prone lying with forearm support:

The upper arm must be vertical to ensure balance in the position with minimum effort and the weight should be evenly distributed along the full extent of the forearm and hand. Support being given to both arms stimulates all muscles of the shoulder region to stabilize the position. A rocking movement transferring weight from arm to arm is useful to promote muscular activity.

DATA ANALYSIS

The statistical analysis was done using paired 't'test where the mean value and t values are calculated. The significance level was set at p=<0.05.

Table 1: Comparison of pre and post-test values within the group A receiving CIMT

S.NO	GROUP	TOOL/SCALE	MEAN		St.d		't' value	Sig.
			Pre Test	Post Test	Pre Test	Post test		
1.	GROUP A	FUGL MEYER	41.6000	46.0000	1.76473	1.92725	-5.134	0.000
		ARAT	23.6000	29.2000	3.73784	6.04979	-1.912	0.000

Graph 1: comparison of pre and post-test values within the group A

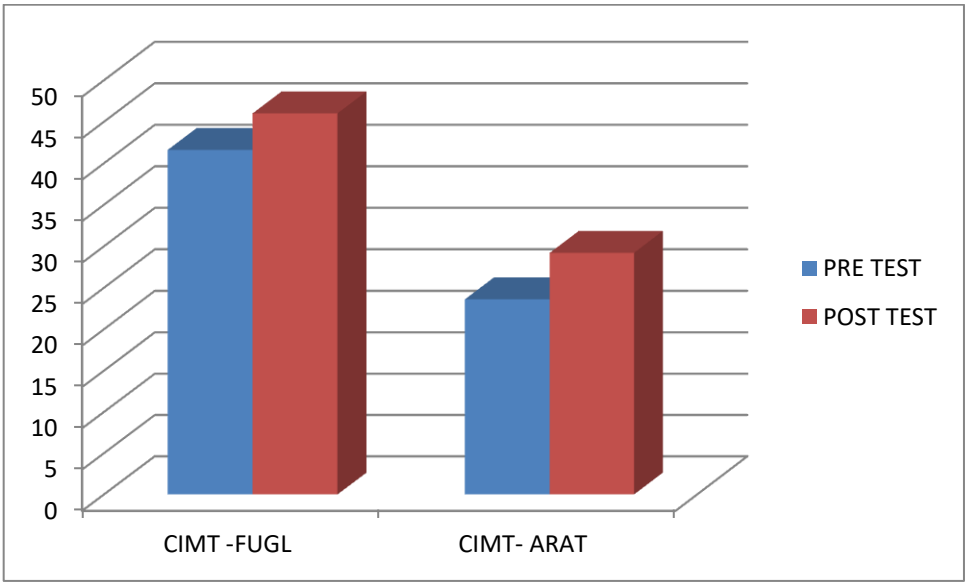

Table-1 represents the mean value, number of samples, paired 't' test values between pre and post tests obtained from the fugal meyer test (FMT) and action research arm test (ARAT) when subjected to constraint induced movement therapy (CIMT).

Table-1shows the analysis of the fugal meyer test (FMT)and action reach arm test (ARAT), the mean value of pre and post-test values of FMT was 41.6000 and 46.0000 t value was -5.134at 0.000 level of significance. The mean value of pre and post-test values of ARAT was 23.6000 and 29.2000 t value was -1.912 at 0.000 level of significance.

Table 2: Comparison of pre and post-test values within the group B receiving Bimanual therapy

S.NO	GROUP	TOOL/SCALE	MEAN		St.d		't' value	Sig.
			Pre Test	Post Test	Pre Test	Post test		
1.	GROUP B	FUGL MEYER	41.2667	42.6000	2.46306	2.52982	-5.134	0.000
		ARAT	21.6000	24.2000	3.24698	4.00357	-1.912	0.000

Graph 2: comparison of pre and post-test values within the group B

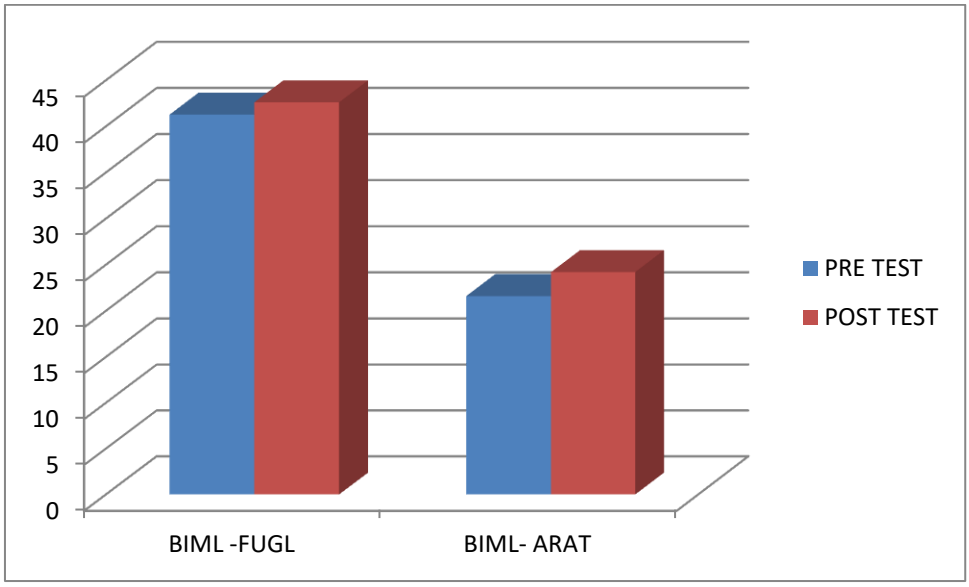

Table-2 represents the mean value, number of samples, paired't' test values between pre and post-tests obtained from the fugal meyer test (FMT) and action research arm test (ARAT) when subjected to Bimanual therapy.

Table-2 shows the analysis of the fugal meyer test (FMT)and action reach arm test (ARAT), the mean value of pre and post test values of FMT was 41.2667 and 42.6000 t value was -5.134 at 0.000 level of significance. The mean value of pre and post-test values of ARAT was 21.6000 and 24.2000 t value was -1.912 at 0.000 level of significance.

Table 3: Comparison of pre and post-test values between the group A and B

S.NO	GROUP	SCALE	MEAN	St.D	't' VALUE	Sig
1.	GROUP A	FUGL	-4.40000	0.98561	-5.134	0.00
		ARAT	-1.3333	2.09307		
2.	GROUP B	FUGL	-5.6000	5.05399	-1.912	0.006
		ARAT	-2.6000	3.37639		

Graph 3: comparison of pre and post-test values between the group A and B

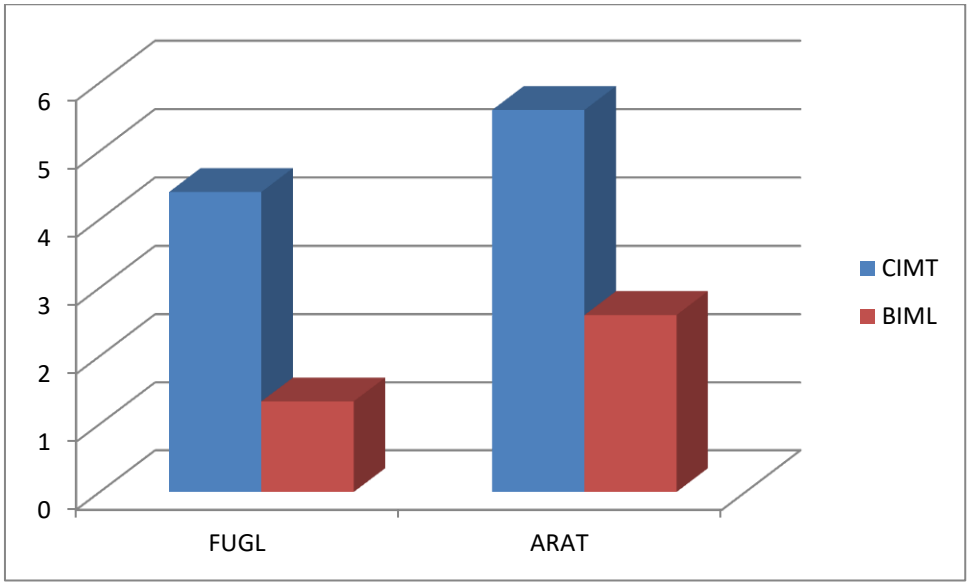

Table-3 shows the mean difference of pre and post-test value of the FMT in group A was -4.4000 and in groupB was -5.6000 and values for ARAT in group A was -1.3333 and in group B was -2.6000.

The mean difference of pre and post-test value between the group A and B shows that there is a significant improvement in group A who receiving CIMT.

RESULT

The result of this study shows that constraint induced movement therapy (CIMT) is significantly more effective in improving upper limb function, which was measured by fuglmeyer test and action research arm test in hemiplegic cerebral palsy. (t=-5.134), (sig=0.000), (p=<0.05).

It is also shown from this study is that bimanual therapy is effective in improving upper limb function, which was measured by byfuglmeyer test and action research arm test in hemiplegic cerebral palsy..(t=-1.912), (sig=0.006),(p=<0.05).

When comparing the values between the group A who received CIMT and group B who receives bimanual therapy, group A shows more significant improvement in response to intervention. Thus, constraint induced movement therapy shows more effective in improving upper limb function in hemiplegic cerebral palsy.

DISCUSSION

There is a significant improvement in upper limb functioning as seen from the outcome of the study after eight weeks of study duration who had a constraint induced movement therapy than the bimanual therapy in hemiplegic cerebral palsy patients. Hence, the null hypothesis is rejected. The study has shown constraint induced movement therapy to be more effective than bimanual therapy. As shown in the table 1 & 2 and graph 1, 2&3.

Constraint induced movement therapy and bimanual therapy have shown effectiveness in chronic conditions individually. No studies have been done to show the comparative effectiveness between CIMT and bimanual therapy in chronic conditions. This study done in a group of hemiplegic cerebral palsy patients have shown significant improvement in upper limb function. Like in this study, previous studies have also shown that CIMT and bimanual therapy is more effective in improving upper limb function than conventional therapy[1, 2].

Many authors have hypothesized how CIMT and Bimanual therapy will work in facilitating recovery. It is shown than upper limb movement may stimulate voluntarily from cortical part of the brain and involuntarily from limbic system[2,7]. Hence, Constraint induced movement therapy application may develop a conscious connection between the use of certain muscles and upper limb functioning. Constraint induced movement therapy may help to retrain the neuromuscular system to function properly based on the idea is that formation of certain patterns of communication between muscles and nerves that allows people to perform simple everyday activities.

CONCLUSION

It is shown from this study that constraint induced movement therapy(CIMT) is more effective than bimanual therapy in hemiplegic cerebral palsy. Since CIMT is a simple, reliable, safe and effective technique. It can be recommended as a method to be followed in hemiplegic cerebral palsy rather than traditional methods like passive movements. However, as this study done in a smaller sample size, future studies have to be done in larger sample size to validate this result.

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APPENDIX-I

INFORMED CONSENT TO PARTICIPATE VOLUNTARILY IN A RSEARCH INVESTIGATION

NAME:

AGE:

GENDER:

OCCUPATION:

ADDRESS FOR COMMUNICATION:

DECLRATION:

I have fully understood the nature and purpose of the study . I accept to be a subject in this study. I declare that the above information is true to my knowledge.

Date:

Time:

Left thumb impression/ signature of the subject

APPENDIX-II

ASSESMENT CHART

NAME:

AGE:

GENDER:

SIDE:

PREVIOUS HISTORY:

FAMILY/SOCIAL/SURGICAL:

HISTORY:

ON EXAMINATION:

HIGHER MENTAL FUNCTION:

SENSORY ASSESSMENT:

MOTOR ASSESSMENT:

MODE OF TREATMENT: CIMT / BIMANUAL THERAPY

MEASUREMENT:

OUTCOME MEASUREMENT	PRE-TEST	POST-TEST
FMT		
ARAT		

APPENDIX-III

OUTCOME MEASUREMENT TOOLS

FMA-UE PROTOCOL — Rehabilitation Medicine, University of Gothenburg

FUGL-MEYER ASSESSMENT
UPPER EXTREMITY (FMA-UE)
Assessment of sensorimotor function

ID:
Date:
Examiner:

Fugl-Meyer AR, Jaasko L, Leyman I, Olsson S, Steglind S: The post-stroke hemiplegic patient. A method for evaluation of physical performance. Scand J Rehabil Med 1975, 7:13-31.

A. UPPER EXTREMITY, sitting position					
I. Reflex activity			**none**	**can be elicited**	
Flexors: biceps and finger flexors (at least one) **Extensors**: triceps			0 0	2 2	
Subtotal I (max 4)					
II. Volitional movement within synergies, without gravitational help			**none**	**partial**	**full**
Flexor synergy: Hand from contralateral knee to ipsilateral ear. From extensor synergy (shoulder adduction/ internal rotation, elbow extension, forearm pronation) to flexor synergy (shoulder abduction/ external rotation, elbow flexion, forearm supination). **Extensor synergy:** Hand from ipsilateral ear to the contralateral knee	Shoulder Elbow Forearm	retraction elevation abduction (90°) external rotation flexion supination	0 0 0 0 0 0	1 1 1 1 1 1	2 2 2 2 2 2
	Shoulder Elbow Forearm	adduction/internal rotation extension pronation	0 0 0	1 1 1	2 2 2
Subtotal II (max 18)					
III. Volitional movement mixing synergies, without compensation			**none**	**partial**	**full**
Hand to lumbar spine hand on lap	cannot perform or hand in front of ant-sup iliac spine hand behind ant-sup iliac spine (without compensation) hand to lumbar spine (without compensation)		0	1	2
Shoulder flexion 0°- 90° elbow at 0° pronation-supination 0°	immediate abduction or elbow flexion abduction or elbow flexion during movement flexion 90°, no shoulder abduction or elbow flexion		0	1	2
Pronation-supination elbow at 90° shoulder at 0°	no pronation/supination, starting position impossible limited pronation/supination, maintains starting position full pronation/supination, maintains starting position		0	1	2
Subtotal III (max 6)					
IV. Volitional movement with little or no synergy			**none**	**partial**	**full**
Shoulder abduction 0 - 90° elbow at 0° forearm pronated	immediate supination or elbow flexion supination or elbow flexion during movement abduction 90°, maintains extension and pronation		0	1	2
Shoulder flexion 90° - 180° elbow at 0° pronation-supination 0°	immediate abduction or elbow flexion abduction or elbow flexion during movement flexion 180°, no shoulder abduction or elbow flexion		0	1	2
Pronation/supination elbow at 0° shoulder at 30°- 90° flexion	no pronation/supination, starting position impossible limited pronation/supination, maintains start position full pronation/supination, maintains starting position		0	1	2
Subtotal IV (max 6)					
V. Normal reflex activity assessed only if full score of 6 points is achieved in part IV; compare with the unaffected side			**0 (IV), hyper**	**lively**	**normal**
biceps, triceps, finger flexors	2 of 3 reflexes markedly hyperactive or 0 points in part IV 1 reflex markedly hyperactive or at least 2 reflexes lively maximum of 1 reflex lively, none hyperactive		0	1	2
Subtotal V (max 2)					
Total A (max 36)					

Approved by Fugl-Meyer AR 2010 — 1 — Updated 2015-03-11

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B. WRIST support may be provided at the elbow to take or hold the starting position, no support at wrist, check the passive range of motion prior testing		none	partial	full
Stability at 15° dorsiflexion elbow at 90°, forearm pronated shoulder at 0°	less than 15° active dorsiflexion dorsiflexion 15°, no resistance tolerated maintains dorsiflexion against resistance	0	1	2
Repeated dorsifexion / volar flexion elbow at 90°, forearm pronated shoulder at 0°, slight finger flexion	cannot perform volitionally limited active range of motion full active range of motion, smoothly	0	1	2
Stability at 15° dorsiflexion elbow at 0°, forearm pronated slight shoulder flexion/abduction	less than 15° active dorsiflexion dorsiflexion 15°, no resistance tolerated maintains dorsiflexion against resistance	0	1	2
Repeated dorsifexion / volar flexion elbow at 0°, forearm pronated slight shoulder flexion/abduction	cannot perform volitionally limited active range of motion full active range of motion, smoothly	0	1	2
Circumduction elbow at 90°, forearm pronated shoulder at 0°	cannot perform volitionally jerky movement or incomplete complete and smooth circumduction	0	1	2
	Total B (max 10)			

C. HAND support may be provided at the elbow to keep 90° flexion, no support at the wrist, compare with unaffected hand, the objects are interposed, active grasp		none	partial	full
Mass flexion from full active or passive extension		0	1	2
Mass extension from full active or passive flexion		0	1	2
GRASP				
a. Hook grasp flexion in PIP and DIP (digits II-V), extension in MCP II-V	cannot be performed can hold position but weak maintains position against resistance	0	1	2
b. Thumb adduction 1-st CMC, MCP, IP at 0°, scrap of paper between thumb and 2-nd MCP joint	cannot be performed can hold paper but not against tug can hold paper against a tug	0	1	2
c. Pincer grasp, opposition pulpa of the thumb against the pulpa of 2-nd finger, pencil, tug upward	cannot be performed can hold pencil but not against tug can hold pencil against a tug	0	1	2
d. Cylinder grasp cylinder shaped object (small can) tug upward, opposition of thumb and fingers	cannot be performed can hold cylinder but not against tug can hold cylinder against a tug	0	1	2
e. Spherical grasp fingers in abduction/flexion, thumb opposed, tennis ball, tug away	cannot be performed can hold ball but not against tug can hold ball against a tug	0	1	2
	Total C (max 14)			

D. COORDINATION/SPEED, sitting, after one trial with both arms, eyes closed, tip of the index finger from knee to nose, 5 times as fast as possible		marked	slight	none
Tremor	at least 1 completed movement	0	1	2
Dysmetria at least 1 completed movement	pronounced or unsystematic slight and systematic no dysmetria	0	1	2
		≥ 6s	**2 - 5s**	**< 2s**
Time start and end with the hand on the knee	at least 6 seconds slower than unaffected side 2-5 seconds slower than unaffected side less than 2 seconds difference	0	1	2
	Total D (max 6)			

TOTAL A-D (max 66)	

ACTION RESEARCH ARM TEST

Patient Name: _____
Rater Name: _____
Date: _____

Instructions

There are four subtests: Grasp, Grip, Pinch, Gross Movement. Items in each are ordered so that:

- if the subject passes the first, no more need to be administered and he scores top marks for that subtest;
- if the subject fails the first *and* fails the second, he scores zero, and again no more tests need to be performed in that subtest;
- otherwise he needs to complete all tasks within the subtest

Activity	Score

Grasp

1. Block, wood, 10 cm cube (If score = 3, total = 18 and to Grip)
   Pick up a 10 cm block _____
2. Block, wood, 2.5 cm cube (If score = 0, total = 0 and go to Grip)
   Pick up 2.5 cm block _____
3. Block, wood, 5 cm cube _____
4. Block, wood, 7.5 cm cube _____
5. Ball (Cricket), 7.5 cm diameter _____
6. Stone 10 x 2.5 x 1 cm _____

Coefficient of reproducibility = 0.98

Coefficient of scalability = 0.94

Grip

1. Pour water from glass to glass (If score = 3, total = 12, and go to Pinch) _____
2. Tube 2.25 cm (If score = 0, total = 0 and go to Pinch) _____
3. Tube 1 x 16 cm _____
4. Washer (3.5 cm diameter) over bolt _____

Coefficient of reproducibility = 0.99

Coefficient of scalability = 0.98

Pinch

1. Ball bearing, 6 mm, 3rd finger and thumb (If score = 3, total = 18 and go to Grossmt) _____
2. Marble, 1.5 cm, index finger and thumb (If score = 0, total = 0 and go to Grossmt) _____
3. Ball bearing 2nd finger and thumb _____
4. Ball bearing 1st finger and thumb _____
5. Marble 3rd finger and thumb _____
6. Marble 2nd finger and thumb _____

Coefficient of reproducibility = 0.99

Coefficient of scalability = 0.98

Provided by the Internet Stroke Center — www.strokecenter.org

Grossmt (Gross Movement)

1. Place hand behind head (If score = 3, total = 9 and finish) _____
2. (If score = 0, total = 0 and finish _____
3. Place hand on top of head _____
4. Hand to mouth _____

Coefficient of reproducibility = 0.98

Coefficient of scalability = 0.97

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Provided by the Internet Stroke Center — www.strokecenter.org

APPENDIX-IV

MASTER CHART

effectiveness of constraint induced movement therapy versus bi-manual training in improving the hand function (upper limb motor function) on children with hemiplegic cerebral palsy...

S.NO	GROUP A (CIMT)				GROUP B (BIMANUAL)			
	FUGL-MEYER		ARAT SCALE		FUGL-MEYER		ARAT SCALE	
	PRE-TEST	POST-TEST	PRE-TEST	POST-TEST	PRE-TEST	POST-TEST	PRE-TEST	POST-TEST
1	43	47	27	39	38	40	24	24
2	38	42	27	33	41	40	21	24
3	41	45	21	27	40	42	18	21
4	42	47	24	30	45	47	18	18
5	45	49	21	27	40	42	21	24
6	40	44	18	21	42	44	27	24
7	42	45	30	36	41	45	24	21
8	41	48	21	21	40	42	18	21
9	43	47	18	36	44	39	21	21
10	44	48	21	21	42	42	24	27
11	41	45	27	24	43	45	24	30
12	40	44	24	27	38	40	21	27
13	40	45	27	33	38	41	27	33
14	42	46	27	36	46	47	18	27
15	42	48	21	27	41	43	18	21